

WHAT IS CLAIMED IS:

- 1 1. A transportation system comprising:
2 a fuel leak detector comprising,
3 a colorimetric chemical monitor configured to change color in
4 response to presence of a fuel, and
5 an optical reader configured to monitor a color of the chemical
6 monitor; and
7 an alarm system in electronic communication with the fuel leak detector and
8 configured to provide an alarm when a color of the chemical monitor changes by a
9 predetermined amount.
- 1 2. The system of claim 1 wherein the colorimetric chemical monitor
2 comprises a porous substrate impregnated with mercurous chloride/methylcellulose reagent.
- 1 3. The system of claim 1 wherein a portion of the porous substrate is
2 impregnated with N-phenylanthranilic acid/titanium dioxide
- 1 4. The system of claim 3 wherein a second portion of the porous substrate
2 is impregnated with mercurous chloride/methylcellulose reagent.
- 1 5. The system of claim 2 wherein the porous substrate comprises paper.
- 1 6. The system of claim 1 wherein the optical reader comprises:
2 a light source configured to illuminate a surface of a porous substrate
3 impregnated with a reagent reactive with a hypergolic fuel component; and
4 an optical detector configured to receive light reflected by the surface of the
5 porous substrate, and in response output a voltage proportional to an intensity of the reflected
6 light.
- 1 7. The system of claim 6 wherein the light source comprises a light
2 emitting diode configured to emit light having a wavelength of about 455 nm.
- 1 8. The system of claim 6 wherein the optical reader further comprises a
2 comparator, the comparator comprising:
3 a first input node configured to electrically communicate with the optical
4 detector,

5 a second input node configured to electrically communicate with a reference
6 voltage, the reference voltage corresponding to a voltage output by the optical detector
7 receiving light reflected from the porous substrate in the absence of a hypergolic fuel
8 component, and
9 an output node configured to output a voltage proportional to a difference
10 between voltages at the first and second input nodes.

1 9. The system of claim 8 wherein the alarm is configured to be triggered
2 when the output voltage appearing on the output node of the comparator exceeds a threshold
3 value.

1 10. The system of claim 8 further comprising a beam splitter configured to
2 cause light from the source to illuminate separate portions of the porous substrate.

1 11. A method for detecting leakage of a hypergolic fuel system, the
2 method comprising:
3 providing a colorimetric chemical monitor;
4 providing an optical reader;
5 monitoring an intensity of reflected light from the colorimetric chemical
6 monitor with the optical reader; and
7 determining a fuel leak when the intensity of reflected light drops below a
8 predetermined threshold.

1 12. The method of claim 11 wherein providing a colorimetric chemical
2 monitor comprises impregnating a porous substrate with mercurous chloride/methylcellulose
3 reagent.

1 13. The method of claim 11 wherein providing a colorimetric chemical
2 monitor comprises impregnating a porous substrate with N-phenylanthranilic acid/titanium
3 dioxide reagent

1 14. The method of claim 11 wherein providing a colorimetric chemical
2 monitor comprises:
3 impregnating a first portion of a porous substrate with mercurous
4 chloride/methylcellulose reagent; and

5 impregnating a second portion of the porous substrate with N-
6 phenylanthranilic acid/titanium dioxide reagent.

1 15. The method of claim 14 wherein impregnating a porous substrate
2 comprises impregnating a porous substrate comprising paper.

1 16. The method of claim 11 wherein providing an optical reader
2 comprises:
3 providing a light source configured to illuminate a surface of a porous
4 substrate impregnated with a reagent reactive with a hypergolic fuel component; and
5 providing an optical detector configured to receive the light reflected by the
6 surface of the porous substrate and in response to output a voltage proportional to the
7 intensity of the reflected light.

1 17. The method of claim 16 wherein providing a light source comprises
2 providing a light emitting diode configured to emit light having a wavelength of about 455
3 nm.

1 18. The method of claim 16 wherein determining a fuel leak when the
2 intensity of reflected light drops below a predetermined threshold comprises:
3 providing a reference voltage to a first input node of a comparator, the
4 reference voltage corresponding to a voltage resulting from the detector reflecting light in the
5 absence of the hypergolic fuel component;
6 providing the output voltage from the optical detector to a second input node
7 of a comparator; and
8 measuring a voltage produced at an output node of the comparator.

1 19. The method of claim 11 further comprising generating an alarm when
2 a fuel leak is determined.

1 20. A method of identifying a fuel leak comprising:
2 generating a voltage based upon comparison of a reference voltage with a
3 voltage generated by a detector receiving light reflected from the surface of a substrate
4 impregnated with a reagent reactive with a fuel component.